

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

## FINAL EXAMINATION

TRIMESTER 2, 2022/2023

### **ECP2056 – DATA COMMUNICATIONS AND COMPUTER NETWORKING** (TE/RE)

14 JULY 2023  
[09:00 AM – 11:00 AM]  
(2 Hours)

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#### INSTRUCTIONS TO STUDENTS

1. This question paper consists of 5 pages including the cover page with 4 Questions only.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

**Question 1**

- a) You are required to design a network to accommodate a number of users in FET building. List **FOUR** criteria that you need to consider in ensuring successful deployment of the network. Decide type of network will be used, Local Area Network (LAN), Metropolitan Area Network (MAN) or Wide Area Network (WAN). Justify your decision.

[6 marks]

- b) Consider a computer is sending a frame to another computer on a bus topology LAN. The physical destination address of the frame is corrupted during the transmission. Predict what happen to the frame. How the sender being notified about the situation?

[3 marks]

- c) Transmission Control Protocol/Internet Protocol (TCP/IP) is a suite of communication protocols used to interconnect network devices on internet.

- (i) Draw a diagram to illustrate five layers of TCP/IP model and explain the functionality of each layer.

[11 marks]

- (ii) Give **TWO** examples of internet protocols for each layer of the TCP/IP model.

[5 marks]

**Continued.....**

**Question 2**

- a) A network with bandwidth of 10Mbps can send an average of 12,000 frames per minute. Each frame consists of an average of 10,000 bits. Calculate the network throughput. Hence, compare throughput to the bandwidth allocated.

[3 marks]

- b) Given a bandwidth of a transmission medium used is 4,000Hz (1000 to 5000 Hz).

- (i) Find the carrier in each direction of transmission if transmission is in ASK full-duplex mode. Assume there is no gap between the bands in two directions.

[5 marks]

- (ii) Calculate the bit rate, if the transmission is in FSK full-duplex mode. Given that the difference between the carrier frequencies is 1000Hz.

[4 marks]

- (iii) Calculate baud rate and bit rate for 8-PSK half-duplex mode transmission.

[5 marks]

- c) Compare asynchronous and synchronous transmission.

[4 marks]

- d) Synchronous TDM is used to combine 30 digital sources, each of 100kbps. Each output slot carries 2 bits from each digital source with one extra bit is added to each frame for synchronization purpose. Calculate:

- (i) The size of output frame in bits.

[1 mark]

- (ii) The output frame rate

[1 mark]

- (iii) The duration of an output frame

[1 mark]

- (iv) The output data rate

[1 mark]

**Continued.....**

**Question 3**

- a) Construct the Hamming code for the bit sequence of 001100. Assuming that the corresponding code is transmitted successfully. Show no error occurs. [8 marks]
- b) A series of packets are transmitted to a common destination using an 8-bit sequence numbers. If this sequence begins with 0, determine:
- (i) The range of sequence number. [2 marks]
  - (ii) The sequence number after sending 350 packets. [2 marks]
  - (iii) The maximum sizes of the send and receive windows for Stop-and-Wait ARQ. [2 marks]
  - (iv) The maximum sizes of the send and receive windows for Go-Back-N ARQ. [2 marks]
  - (v) The maximum sizes of the send and receive windows for Selective Repeat ARQ. [2 marks]
- c) Consider a 4km point-to-point link with maximum bit rate of 200Mbps.
- (i) Calculate the total time required to send a frame of 6000 bits from a bus-end station A to another bus-end station B. Assume propagation speed is 200m/ $\mu$ s. [3 marks]
  - (ii) If station B starts to transmit at exactly the same time when the signal from station A arrives, their signal will interfere with each other and time is wasted in delivering these corrupted frame. Calculate time wasted in delivering the corrupted frames. Also, determine time wasted at station A for CSMA and CSMA/CD access methods (jam signals and backoff time are excluded). [4 marks]

**Continued.....**

**Question 4**

- (a) Consider ACK6 has been received by the sender in a Go-Back N sliding window system. If frames 6,7,0,1 and 2 are sent, for a different scenario, discuss the significance of receiving ACK0 and ACK3.

[4 marks]

- (b) The following is a dump of a UDP header in hexadecimal format:

|                         |
|-------------------------|
| 0B 84 00 0D 00 1C E2 17 |
|-------------------------|

Determine:

- (i) The source port number. [2 marks]
  - (ii) The destination port number. [2 marks]
  - (iii) Total length of the user datagram. [2 marks]
  - (iv) Length of the data. [2 marks]
  - (v) Direction of the packet (from a client to a server or from a server to a client). Justify. [2 marks]
- (c) A company has a network address of 126.xxx.xxx.xxx. As number of employees is increasing, the management decided to design a network so that it has a maximum of 62 usable subnets.
- (i) Classify the class of the network address for the above company. [1 mark]
  - (ii) Describe the benefits of implementing subnet. [3 marks]
  - (iii) Deduce the maximum port number of hosts in each subnet. [5 marks]
  - (iv) Determine which subnet mask you should assign. Show your answer in binary representation as well as dotted decimal. [2 marks]

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